

WHAT IS CLAIMED IS:

1. A dialysis catheter comprising:

a catheter body having a proximal portion, a distal portion, a first longitudinally extending central lumen configured to deliver blood, and at least three longitudinally extending lumens positioned radially of the first lumen, the at least three lumens configured to withdraw blood from a patient,

at least one blood delivery opening formed in the distal portion of the catheter body, the at least one blood delivery opening being in fluid communication with the first lumen and configured for passage of blood therethrough; and

at least three blood withdrawal openings formed in the outer wall of the catheter body, each of the blood withdrawal openings being in fluid communication with one of the at least three lumens and configured for passage of blood from a patient.

2. The catheter of claim 1, wherein the at least three blood withdrawal openings are spaced proximally of the at least one blood delivery opening.

3. The dialysis catheter of claim 1, wherein the first lumen is substantially rectangular in cross-section and each of the at least three longitudinally extending lumens is substantially oval-like in cross-section.

4. The dialysis catheter of claim 3, wherein the cross-sectional configuration of the first lumen and of the at least three longitudinally extending lumens each transitions to a substantially circular cross-section at a proximal portion.

5. The dialysis catheter of claim 2, further comprising a distal tip portion at the distal portion of the catheter body, the distal tip portion having a first stiffness greater than a second stiffness of an intermediate portion of the catheter body and being sufficiently rigid to dilate tissue as the catheter is inserted into a patient.

6. The dialysis catheter of claim 1, wherein the blood withdrawal openings are elongated in an axial direction and intersect a transverse plane of the catheter.
7. The dialysis catheter of claim 1, wherein the at least three blood withdrawal openings form a first set of openings, and the catheter body further comprises a second set of blood withdrawal openings, the second set of blood withdrawal openings second spaced proximally from the first set of openings.
8. The dialysis catheter of claim 1, wherein the distal portion of the catheter body includes an internal threaded portion to engage a stiffening member inserted through the first lumen to temporarily mount a stiffening member within the catheter.
9. The dialysis catheter of claim 1, wherein the distal tip portion of the catheter includes a shoulder adapted to abut a stiffening member inserted through the first lumen.
10. The dialysis catheter of claim 9, further comprising a stiffening member removably positionable within the catheter body in abutment with the shoulder, the stiffening member placing the catheter body in tension, and wherein torquing the stiffening member stretches the catheter body to reduce at least a portion of an outer diameter of the catheter body.
11. The dialysis catheter of claim 10, wherein a proximal portion of the stiffening member has a series of threads for mounting the stiffening member to the catheter.
12. The dialysis catheter of claim 1, further comprising a plurality of spacers extending from an outer wall of the catheter body to prevent contact of the at least three blood withdrawal openings with a vessel wall of a patient.
13. The dialysis catheter of claim 1, wherein a distal portion of the catheter tapers to a reduced diameter region.

14. The dialysis catheter of claim 13, wherein the blood delivery openings are elongated and are formed adjacent the reduced diameter region.

15. The dialysis catheter of claim 1, wherein the catheter body has an outer diameter, and further comprising a stiffening member removably positioned within the catheter body, the stiffening member placing the catheter body in tension to stretch the catheter body, thereby reducing at least a portion of the outer diameter of the catheter body during insertion.

16. The dialysis catheter of claim 1, wherein a distal portion of the catheter body has a stiffening insert positioned therein, the insert having a lumen formed therein communicating with the first lumen.

17. A catheter for delivering and withdrawing blood from a patient's body, the catheter comprising:

a catheter body having an outer wall, a distal tip portion, a first lumen extending from a proximal portion of the catheter body through the distal tip portion and configured to receive a guidewire therein, first and second longitudinally extending lumens independent of the first lumen, and first and second radially spaced openings in the outer wall, the first opening being in fluid communication with the first longitudinally extending lumen and the second opening being in fluid communication with the second longitudinally extending lumen; and

a stiffening insert positioned in the distal tip portion, the stiffening insert having a first stiffness greater than a second stiffness of the distal tip portion, the stiffening insert having a lumen therethrough communicating with the first lumen extending through the distal tip portion.

18. The catheter of claim 17, further comprising at least two ports formed in the outer wall of the distal tip portion, the at least two ports being in fluid communication with the first lumen of the distal tip portion and positioned proximally of the stiffening insert.

19. The catheter of claim 17, wherein the distal tip portion has a bullet nose configuration.

20. The catheter of claim 17, wherein the distal tip portion tapers to a reduced diameter region.

21. A catheter for delivering and withdrawing blood from a patient's body, the catheter comprising:

a catheter body having an outer wall, a distal portion, a central lumen extending from a proximal portion of the catheter body to the distal portion and configured to receive a guidewire therein and to allow blood passage therethrough, at least three longitudinally extending lumens independent of the central lumen, the at least three lumens radially displaced with respect to the central lumen;

at least three openings in the outer wall of the catheter body, each opening being in fluid communication with one of the at least three longitudinally extending lumens; and

a stiffening member removably positionable within the central lumen, the stiffening member removably mountable to the catheter and including a lumen for receiving a guidewire therethrough.

22. The catheter of claim 21, wherein the stiffening member terminates proximally of a distalmost tip of the catheter body.

23. The catheter of claim 21, wherein the stiffening member extends distally of a distalmost tip of the catheter body.

24. The catheter of claim 21, wherein the stiffening member has a threaded portion on a proximal end portion for mounting the proximal end of the stiffening member to the catheter and for torquing the stiffening member to stretch the catheter body.

25. The catheter of claim 24, wherein the stiffening member has an abutment surface for abutting a surface formed internally in the distal tip portion of the catheter body to limit insertion of the stiffening member.

26. A system for placement of a dialysis catheter comprising a dilating trocar and a dialysis catheter, the system comprising:

- a) a trocar having an elongated tubular portion and a lumen extending longitudinally through the tubular portion, the tubular portion terminating in a dilating tip configured to dilate tissue and create a subcutaneous tissue tunnel, the lumen of the trocar having a first internal diameter and configured to removably receive a guidewire therethrough for retrieval of the guidewire; and
- b) a dialysis catheter having a first lumen configured for blood delivery and a second independent lumen configured for blood withdrawal from the patient, at least a portion of the catheter having an outer diameter configured for insertion through the subcutaneous tissue tunnel, one of the lumens of the catheter configured to receive the guidewire for over the wire insertion of the dialysis catheter through the tissue tunnel when the trocar is removed.

27. The system of claim 26, further comprising an elongated opening formed in the trocar communicating with the lumen of the trocar for insertion of the guidewire.

28. A catheter for delivering and withdrawing blood from a patient's body, the catheter comprising:

a catheter body having an outer wall, a distal portion, a central lumen extending from a proximal portion of the catheter body to the distal portion and configured to receive a guidewire therein and to allow blood passage therethrough, at least three longitudinally extending lumens independent of the central lumen, the at least three lumens radially displaced with respect to the central lumen;

at least three openings in the outer wall of the catheter body, each opening being in fluid communication with one of the at least three longitudinally extending lumens;

a first intermediate tube extending from a proximal end of the central lumen and second, third and fourth intermediate tubes each extending from a proximal end of one of the at least three lumens;

a first extension tube having a lumen formed therethrough communicating with the first intermediate tube; and

a second extension tube having at least three lumens formed therethrough, each lumen communicating with a respective second, third, and fourth intermediate tubes.

29. The catheter of claim 28, wherein at least a portion of the intermediate tubes are contained within a hub of the catheter.

30. The catheter of claim 28, wherein the lumens of the first and second extension tubes each transition from a first cross-sectional configuration to a second different cross-sectional configuration.